

**Table 1.** Phytanic acid and phytol content of foods. Results for phytanic acid are compared with those previously reported by this group and from the literature

Food	Phytanic acid mg/100 g food			Phytol mg/100 g food	
	This study	Previous study	Lit.		
				cis	trans
Cereals and cereal products					
Wholemeal flour (Allinson)	0.0				
White flour	0.0	0.0			
Wholemeal bread (Hovis)	0.0	0.0		0.25	0.0
Wheat germ	0.0				
Porridge oats	0.0	1.8	0.0	0.0	0.0
Sago	0.0			0.0	0.0
Tapioca	0.0			0.0	0.0
Rice, white (boiled)	0.0	1.0			
Ryvita (dark)	0.0				
Breakfast cereals					
Kelloggs—Special K	0.0				
Smacks	0.0				
Corn Flakes	0.0	1.2			
Rice Krispies	0.0	2.7		0.0	0.0
Honey Nut Loops	0.0				
Crunchy Nut Cornflakes	0.0				
Start	0.0				
Frosties	0.0			0.0	0.0
Cocopops	0.0				
Bran Flakes (Sainsbury)	0.0				
Weetabix	0.0	1.5			
Biscuits					
Rich Tea (McVities)	12.3	8.9		0.0	
Rich Tea (Sainsbury)	0.0				
Bourbon (Waitrose)	0.0				
Choc. Chip Orange Cookies (Waitrose)	0.0				0.0
Cream Crackers (Jacobs)	0.0	0.0		0.0	
Pastry					
Mr Kipling Apple Pie	38.1				0.0
Soya products					
Tofu Soya Curd	0.0			0.0	0.0
Soya Chunks (Protovég)	0.0	3.8		0.5	0.0
Soyamix (Sosmix)	0.0				
Milk and milk products					
Homogenized whole milk	9.7		0.3		
Evaporated milk	24.4				
Skimmed milk powder (Marvel)	0.0		0.5	0.0	0.0
Liquid skimmed milk	0.0				
Baby milk powder (SMA Gold old formula)	3.0				
Double cream	44.1				
'Elmlea' Double	30.0				
Low fat natural yoghurt (cows)	2.1				
Sheeps' milk yoghurt	6.6				
Mature Canadian cheddar	98.9				
Processed cheese (Kraft Singles)	65.6			0.0	0.0
Processed cheese (Dairylea Triangles)	52.5	7.7			

Table 1. continued.

Food	Phytanic acid mg/100 g food			Phytol mg/100 g food	
	This study	Previous study	Lit.		
				cis	trans
Stilton cheese	7.8				
Camembert cheese	51.5	8.5			
Cream cheese (45% fat)	129.4		Cheese		
Half fat cottage cheese	6.8	1.8	5-50	0.0	0.0
Danish blue cheese	25.0				
Goats' milk cheese	17.3				
Flora 'Alternative to Cheddar Cheese'	0.0				
Shape 'Spread with Mature Cheddar' (St Ivel)	76.7			0.0	1.67
Very low fat fromage frais	0.0				
Non-dairy topping (Nestlé Tip-Top)	0.0				
Non-dairy ice-cream (Walls Blue Ribbon— Vanilla)	0.0	3.1 Lyons			
Milk substitutes					
Coffeemate	0.0				
Soya Milk (White Wave)	0.0				
Fresubin Nut Flavour (Fresenius)	0.0				
Eggs					
Egg Yolk	0.0	0.0	0.22		
Fats and oils					
Butter	176.7	10.2	50-500	0.0	2.25
Fish Oil (Maxepa Capsule)	637.4				
(Maxepa Liquid)	753.3				
Lard	0.0	0.0	1.2		
Beef suet (Atona)	45.6				
Margarines and spreads					
Stork Special Blend	275.2				
Flora Sunflower	0.0	14.1			
Flora Extra Light	0.0	0.0			
St Ivel Gold	0.0	5.8	Margarine		
Tomor	0.0		6-130		
Tesco Soya Margarine	0.0				
Trex Solid Sunflower	0.0				
Krona Margarine	76.0	13.0			
Vegetable oils					
Olive oil (Virgin)	0.0			0.0	0.0
Soya	0.0	14.0			
Arachis (Peanut)	0.0				
Rapeseed	0.0			0.0	0.0
Corn	0.0	0.0	0.0		
Safflower	0.0	1.4		0.0	0.0
Sunflower	0.0	0.5			
Meat and meat products					
Beef—lean 'organic'	4.3	23.6		0.0	0.0
Beefburger (McDonalds)	33.1				
Beef fat 'organic'	325.9		trace		
Lamb liver (raw)	57.2				

Table 1. *continued.*

Food	Phytanic acid mg/100 g food			Phytol mg/100 g food	
	This study	Previous study	Lit.	<i>cis</i>	<i>trans</i>
Pork—lean roast	0.0	3.8	0.04		
Pork—luncheon meat	0.0			0.0	0.0
Ham	0.0	5.7	0.7	0.0	0.0
Pigs liver	0.0	36.1			
Pigs kidney	0.0				
Pork and turkey sausages (Matthews)	0.0	0.0			
Rabbit (lean and fat)	4.2	2.2			
Poultry					
Chicken leg meat	0.0	0.0	1.8	0.0	0.0
Chicken liver	0.0	0.0			
Duck meat (lean)		7.9			
Duck fat	0.0			0.0	0.0
Turkey (minced dark and light meat)	0.0			0.0	0.0
Meat substitutes					
Micoprotein—Quorn	0.0			0.0	0.0
Fish					
Cod, frozen raw	5.4	4.2	0.3	0.0	0.0
Coley, frozen raw	2.2				
Crab, tinned white meat	1.7	5.0			
Haddock, smoked	5.1	2.6			
Mackerel, tinned in brine	39.7		3-18	0.0	0.0
Plaice, frozen raw	11.2				
Prawns, tinned in brine	1.2			0.0	0.0
Salmon, fresh Scotch	110.3		2.0		
Salmon, canned USA	255.1		11-29		
Sardines, tinned in brine	40.3		58.0	0.45	0.42
Tuna, tinned in water	4.9	25.4	0.6-0.9		
Vegetables					
Onions, dried	0.0	0.0			
Peas, dried	0.0	0.0		0.12	0.1
Peppers, dried	0.0			0.06	0.1
Potatoes, dried (Smash)	0.0	3.2			
Crisps					
Walkers	3.9			0.0	0.0
Sainsbury Lower Fat	0.0			0.0	0.0
Golden Wonder	0.0				
Mushrooms, dried	0.0	0.3			
Tomato puree	0.0	0.0	0.13	0.0	0.0
Pulses					
Baked beans in tomato sauce (Heinz)	0.0	2.9		0.2	0.0
Red kidney beans, tinned	0.0	0.6		0.0	0.0
Lentils, cooked	0.0	0.6			
Tahini (Sesame paste)	0.0				
Fruit					
Apple	0.0	0.0			
Banana	0.0	0.0			
Orange juice	0.0	0.1		0.0	0.0

Table 2. Fat content and phytanic acid in fish

Fish	g Fat/100 g fish	mg Phytanic acid/100 g fish	mg Phytanic acid/g fat
Cod, raw	0.7	5.4	7.7
Coley, raw	1.1	2.2	2.0
Crab, white meat	0.3	1.7	5.7
Haddock, smoked	0.9	5.1	5.7
Mackerel, canned in brine	13.0	39.7	3.1
Plaice, raw	2.2	11.2	5.1
Prawns, canned in brine	1.0	1.2	1.2
Salmon, fresh Scotch	10-13	110.3	8.5
Salmon, canned USA	8.0	255.1	31.9
Sardines, canned in brine	8.3	40.3	4.9
Tuna, canned in water	1.1	4.9	4.5
Maxepa Fish Oil, capsules	100/100 ml	637.4	6.4/ml
Maxepa Fish Oil, liquid	100/100 ml	753.3	7.5/ml

cream, very low fat fromage frais and fully skimmed milk contained no phytanic acid.

### Fish

All fish and fish products analysed contained phytanic acid: the amount found increased in proportion to the fat content of the fish (Table 2).

### Meats

Poultry such as chicken, turkey, and duck were free of phytanic acid, as were pork, pig offal and processed pork.

Phytanic acid was found in beef and to a lesser extent in rabbit. Attempts to analyse lamb meat and fat were inconclusive because of interference, but phytanic acid was found in lamb's liver (and also in sheep's milk yoghurt).

### Fruit and vegetables

No phytanic acid was found in any of the fresh and dried fruits, pulses or dried vegetables. A small amount was found in walnuts but not in any of the other four varieties of nut, nor in arachis (peanut) oil.

### Miscellaneous foods

None of the beverages contained phytanic

acid. Manufactured foods such as soups, chocolate and biscuits which did contain phytanic acid were those which had animal fats listed in the ingredients: those containing only vegetable fats contained no phytanic acid.

Small amounts of phytol have been found in many of the 57 foods analysed. The highest values were found for oxo cubes (meat based) and leaf tea.

### Discussion

The number and variety of foods analysed were significantly greater than previously reported. In general, the results were in agreement with those already published. Some discrepancies do arise, for example in the case of nuts, especially peanuts, and vegetable oils. These can be accounted for by a change in the experimental conditions used in the analysis. The use of a 70% cyanopropyl siloxane column with temperature gradient enhanced the resolution of the phytanic acid peak: in addition, extracting the food with, and without, the internal standard overcame the problem of interference with the  $C_{15}$  fatty acid. It is also possible that changes in food-processing methods, especially in the refining of oils, have resulted in changes in the composition of these foodstuffs.